

REMARKS

Applicant has considered the outstanding official action. It is respectfully submitted that all the claims are directed to patentable subject matter as set forth below.

The outstanding rejections based on prior art are as follows:

- (1) Claims 37, 42, 43 and 44 under 35 U.S.C. §103(a) over U.S. Patent No. 3,650,016 (McMaster); and
- (2) Claims 38, 40 and 41 under 35 U.S.C. §103(a) over McMaster as applied above and further in view of U.S. Patent No. 5,035,142 (Dryga).

Claim 37 is the sole pending independent claim.

Claim 39 (which is dependent on independent claim 37) is stated to be allowable if rewritten in independent form. Applicant has rewritten claim 39. Thus, applicant submits that claim 39 is in condition for allowance. Formal allowance is respectfully requested.

The claimed invention is directed to apparatus for impact treatment of product bodies comprising in combination a source of repetitive impulse energy, and a transducer adapted to introduce pulse energy from the source by mechanical contact at an external body surface to generate in an interior zone of a body structure corresponding

compression wave energy that provides residual plastic deformation of internal body structure having a favorable residual stress pattern in the body structure. Claim 37 has been amended to further claim the transducer as being movable during application of the vibrating treatment. The applied art does not teach or suggest such a structure. Support is present in the captioned application, e.g. at page 29, fourth and fifth paragraphs, and page 44, first full paragraph.

McMaster teaches a source of vibratory-mechanical energy and transducer for transmitting energy from the source via a stationary coupling or concentrator to a bolt or other type of threaded fastener in order to cause the bolt to vibrate at its natural frequency to increase and decrease the bolt in length. The bolt is then tightened using finger pressure. Thus, the device of McMaster is fixed to the threaded component and excites the threaded component at a resonant frequency thereof and, during ultrasonic treatment, is stationary and connected to the area of a direct acoustic contact with stringent requirements for the treatment quality for adjoining surfaces.

There are two principal drawbacks of the device described in McMaster as compared to applicant's claimed device, namely, (1) the excitation at a resonance frequency

significantly limits the technological effectiveness of the device as compared with the claimed invention wherein treatment is possible regardless of the natural frequency of the object; and (2) a near-ideal acoustic contact must be provided by the device of McMaster or otherwise the operation of the McMaster system will not be efficient and will result in a significant increase in cost to implement the method using the device of McMaster and will limit the area of application to a limited number of problems where cost is not important in selecting a technology to be used. With applicant's claimed apparatus, since the contact is not made as a direct acoustic connection in a fixed manner, but rather via an intermediate mass, the high-intensity ultrasonic vibrations are introduced in the treated object without any special processing of the surface quality requirements (e.g., roughness and hardness) and in its initial condition.

McMaster teaches an oscillating system which requires a stationary application. This requires the oscillating body to be directly attached to the body being subjected to the vibrations. Thus, to work on different areas of the body being treated requires the system be detached, relocated and reattached to the new location. With the claimed apparatus, application of treatment does not require a fixed connection between the transducer and

the object. During treatment the transducer is movable along a surface of the object, which is not possible with the device of McMaster. The apparatus taught in McMaster requires steady and continuous contact to a fixed point on a work product. Thus, the energy-carrying components taught in McMaster are resonance concentrators of oscillating velocity, whereas the claimed invention provides non-resonance energy, i.e., pulse or impact energy. Due to the apparatus providing pulse energy, the apparatus can move freely relative to the surface of a work product and its operation is not based on contact ultrasonic excitation but rather on pulse or impact interaction with the treated surface in any required point of the surface.

Accordingly, McMaster does not teach applicant's claimed invention. Further, no suggestion is provided by McMaster which would motivate one skilled in the art to modify McMaster in order to obtain applicant's claimed invention. Withdrawal of the §103 rejection based on McMaster is respectfully requested.

As to the rejection based on McMaster in combination with the secondary reference Dryga, applicant respectfully submits that Dryga does not make up for the shortcomings of McMaster as set forth above. Dryga teaches apparatus for vibratory treatment of workpieces wherein the

apparatus is rigidly secured to a workpiece and remains stationary during treatment.

The apparatus of Dryga operates in the area of natural (and hence low) frequencies of the structure and excites resonance vibrations therein. The apparatus is rigidly secured on a treated structure at a specific point and remains stationary throughout the treatment. This is based on the application of fluctuating (cyclic) stresses in the elastic region of the metal deformation and is dependant on the natural frequency of the structure being excited.

The apparatus claimed by applicant does not depend in any manner on the natural frequency of the structure or component being treated. The transducer of the claimed apparatus is easily moved along the surface of a metal in a free fashion and is not fixed to the surface being treated. In addition, in the use of the claimed apparatus the technical effect is achieved by creating plastic deformation of the treated area and through this transferring in the work piece material. The level of the intensity of these ultrasonic waves, stresses and oscillations is sufficient to create the change in material condition as required in the treated material. Applicant's claimed invention is not concerned with natural frequency and resonance vibrating but rather with impulse energy and compression wave energy.

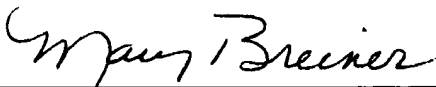
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Accordingly, Dryga also does not teach applicant's claimed invention. Further in view of each of McMaster and Dryga teaching away from the invention, it is respectfully submitted that no suggestion is provided to modify the teachings of the applied references in order to obtain the claimed invention. Withdrawal of the §103 rejection based on McMaster and Dryga is respectfully requested.

Reconsideration and allowance of the claims is respectfully urged.

Respectfully submitted,

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